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Signed *Andrew George*

Dated 8 November 1999





30NOV98 E408054 2 D00318  
P01/7700 0.00 9826033.4**Request for grant of a patent**

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## 1. Your reference

AJL/IR/P4173

## 2. Patent application number

28 NOV 1998

**9826033.4**

(The Patent Office will fill in this part)

3. Full name, address and postcode of the or of each applicant (*underline all surnames*)Quay Technologies Limited,  
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UKPatents ADP number (*if you know it*)

If the applicant is a corporate body, give the country/state of its incorporation

755877 8001

## 4. Title of the invention

Ultra Violet Radiation

5. Name of your agent (*if you have one*)"Address for service" in the United Kingdom to which all correspondence should be sent (*including the postcode*)

F51/77

Patents ADP number (*if you know it*)ROYSTONS,  
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Bucks SL7 2BT6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (*if you know it*) the or each application number

Country

Priority application number  
(*if you know it*)Date of filing  
(*day / month / year*)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(*day / month / year*)8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (*Answer 'Yes' if:*

Yes

- a) any applicant named in part 3 is not an inventor, or
  - b) there is an inventor who is not named as an applicant, or
  - c) any named applicant is a corporate body.
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Continuation sheets of this form	4
Description	
Claim(s)	
Abstract	
Drawing(s)	1 ✓

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Priority documents	-
Translations of priority documents	-
Statement of inventorship and right to grant of a patent (Patents Form 7/77)	-
Request for preliminary examination and search (Patents Form 9/77)	-
Request for substantive examination (Patents Form 10/77)	-
Any other documents (please specify)	-

11.

I/We request the grant of a patent on the basis of this application.

Signature

Date


 ROYSTONS - Authorised Representative 27.11.98

12. Name and daytime telephone number of person to contact in the United Kingdom

A. J. Lyons - 0151-236 5147/1417

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TITLE: Ultra Violet Radiation Treatment Systems.

DESCRIPTION

This invention concerns Ultra Violet treatment systems particularly but not exclusively for treatment of water.

It is known that UV irradiation can be useful in the process of purifying water. UV radiation can have in particular, germicidal properties. Currently UV radiation can be provided by means of special fluorescent tubes with no phosphor coatings that provide only about 30 watts of power per metre of tube.

An object of this invention is to provide an alternative source of UV radiation, particularly for use in water treatment.

According to this invention there is provided apparatus for providing UV radiation comprising a cavity, a microwave energy source for feeding energy into the cavity and at least one lamp at least partially within the cavity for converting microwave energy into UV radiation.

The present invention further provides a method of providing UV radiation comprising the steps of irradiating at least one lamp with microwave radiation, whereby the microwave energy is converted into UV radiation.

The present invention is particularly suitable for use in purifying water by killing bacteria. The cavity may be arranged to have the water to be treated flowing

therethrough. Accordingly the cavity preferably has a water inlet and a water outlet. The chamber may be arranged in a water supply line, so that no additional pump means is needed to promote water flow through the chamber, although pump means may be provided, if necessary.

The invention may be used for other purposes than water treatment where a source of UV radiation is desirable, such as for killing bacteria on fruit, vegetables and the like or for cleaning implements, such as, for example cutlery, medical instruments and the like.

The at least one lamp preferably comprises a partially evacuated tube containing an element or mixture of elements in vapour form. The element or elements may be any that can produce light when activated. Mercury is the preferred element for UV lamps used in the invention but alternatives include mixtures of inert gases with halogen compounds, sodium and sulphur.

The microwave radiation may be produced by a magnetron operating at its designed frequency. The magnetron is preferably coupled into a waveguide for clarity that matches its operating frequency so that substantially of its power is transferred to the waveguide.

It is important to match the lamp temperature to the microwave E field because vapour pressure of the elements within the lamp increases with temperature. Operating temperatures around 50°C are desirable for mercury lamps.

This invention will now be further described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a schematic diagram of a first embodiment of the invention; and

Figure 2 is a schematic diagram of a second embodiment of the invention.

Referring to Figure 1 of the accompanying drawings, a water treatment system comprises a chamber 10 having a conduit 12 running through it. The conduit 12 is a UV transparent quartz tube and is connected into a water supply line, so that water is fed through the chamber.

Connected to the chamber 10 is a magnetron (not shown) for providing microwave radiation in the chamber. Within the chamber 10 are two mercury lamps 14. The mercury lamps 14 each comprise a quartz tube containing mercury vapour at low pressure and have no electrodes.

In use, as water is flowing through the conduit 12 microwave radiation is produced within the chamber and causes the lamps to produce UV radiation. The UV radiation acts on the water passing through the conduit to kill bacteria within the water.

The chamber 10 acts as a microwave cavity and its size determines the frequency of the magnetron that can be operated with that cavity. A waveguide size of 3.422 x 1.7" is suitable for a magnetron operating at 2.46GHz. The mercury lamps convert 90% of the microwave energy produced into UV lines at 254nm and 185nm. These two UV lines have different principal effects. The 254nm line has generally germicidal properties, whereas the 185nm line is ozone producing. The operating temperature of the lamps is ideally at 50°C in order to optimise the production of the 354nm line. The lamps 14 are capable of producing up to 1KW of radiation per metre but this value will depend on the amount of energy supplied into the cavity.

In Figure 2 of the accompanying drawings a variation on the water treatment system of Figure 1 is shown. A chamber 20 is lined internally with an insulating

material 28. The chamber has an inlet 22 and an outlet 24 so that water can flow through the chamber. The chamber acts as a microwave cavity and has a magnetron (not shown) connected to it. A UV lamp 26 of the type described with reference to Figure 1 of the drawings is positioned in the chamber. The microwave cavity could be 9.75" x 4.875" to operate effectively with a magnetron tuned for 896MHz.

The water treatment system of Figure 2 operates in a similar way to the system of Figure 1 except that water flows through the microwave cavity itself instead of through a conduit in the microwave cavity.

It will be appreciated that the UV treatment system of the invention may be modified for any form of liquid treatment whether it be of a batch type or continuous flow provided that UV radiation can be applied thereto. The system may be used for dry applications.



